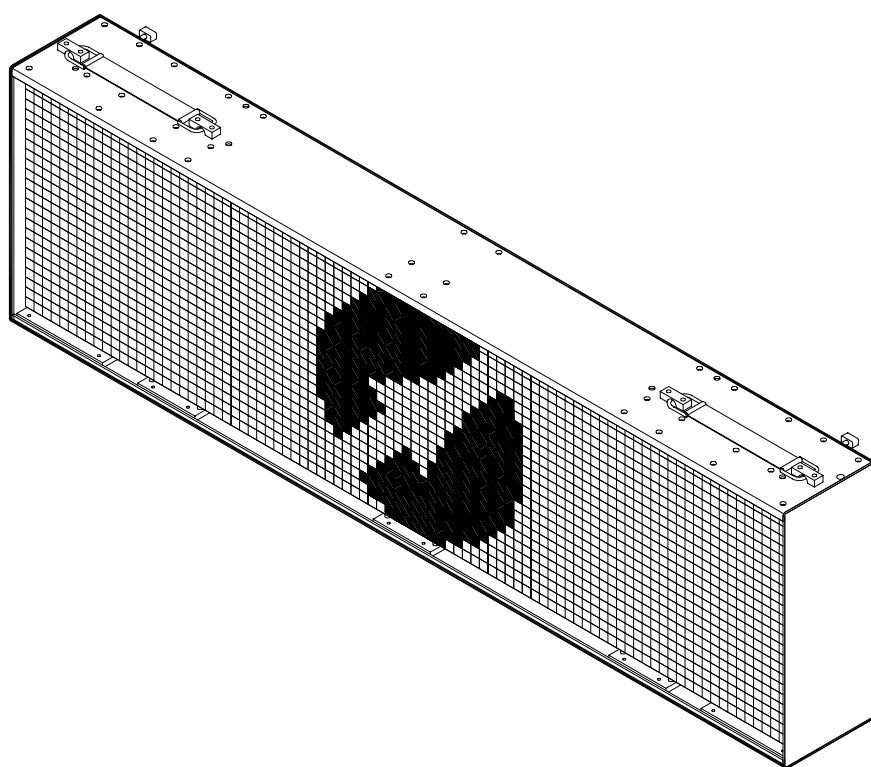


GRAPHIC DISPLAYBOARD

μGRAPH

User manual



Version 1.04

MICRO  GATE

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<http://www.microgate.it>

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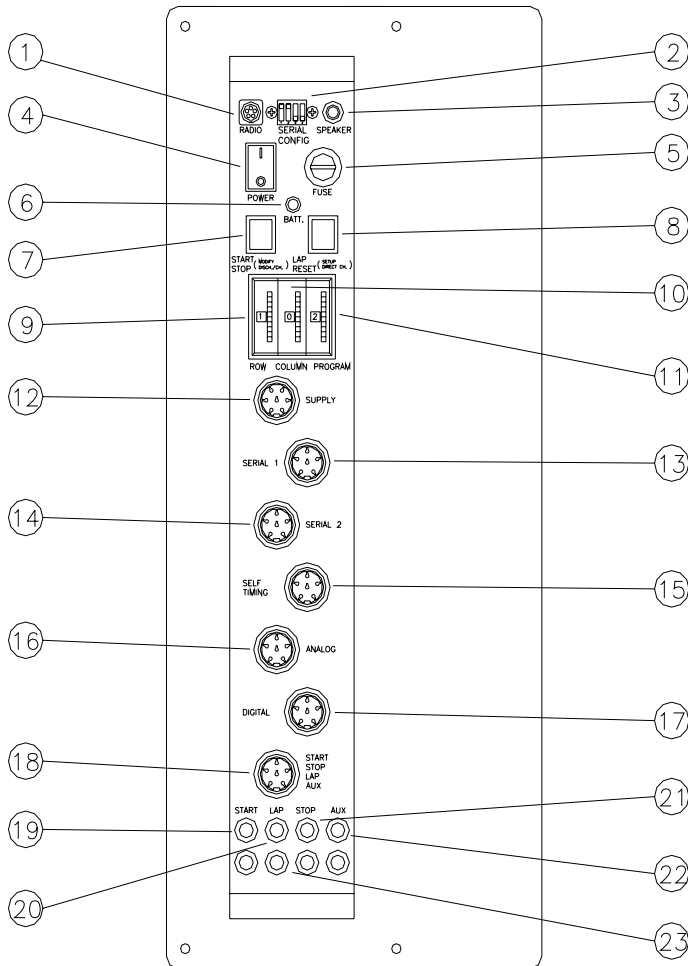
GRAPHIC

DISPLAYBOARD

μGRAPH

(MICROGRAPH)

1.1 CONTROL PANEL


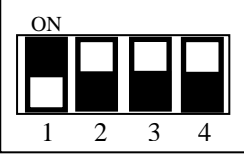
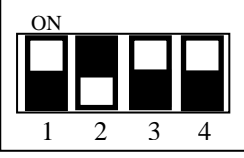

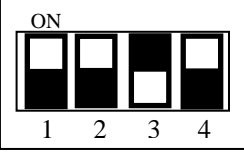
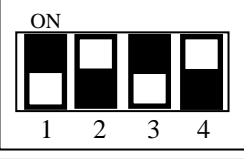
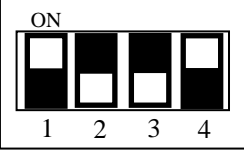
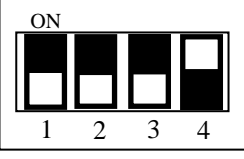
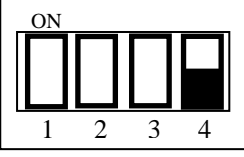
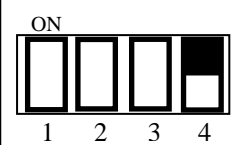


1. 5 pole Nucletron Connector for *Linkgate* system input
2. 4 way DIP-SWITCH Selector for SERIAL input mode selection
3. Jack Connector for external speaker connection
4. On/Off switch
5. Fuse Cavity
6. Internal battery status signal Led
7. Green button START STOP (MODIFY DISCHARGE/CHARGE) used for:
 - manual START and STOP signals
 - modification of values in program setting (keep pressed down for fast forward)
 - selection of battery discharge and recharge
8. Yellow button LAP RESET (SETUP DIRECT CHARGE) used for:
 - manual LAP signals and displayboard RESET
 - confirmation of program settings
 - selection of immediate battery recharge selection
9. Rotating selector for setting of displayboard "line"
10. Rotating selector for setting of displayboard "column"

11. Rotating selector for program selection
12. 7 pole Amphenol connector for external power supply and battery recharge
13. 6 pole Amphenol input/output connector for serial 1
14. 6 pole Amphenol input/output connector for Serial 2
15. 6 pole Amphenol connector for connection of SELF TIMING systems
16. 6 pole Amphenol analog input connector
17. 6 pole Amphenol digital input connector
18. 6 pole Amphenol input connector for START, STOP, LAP and AUX signals
19. START input banana jack
20. STOP input banana jack
21. LAP input banana jack
22. AUX input banana jack
23. Ground banana jacks

1.1.1 Serial Velocity Selector

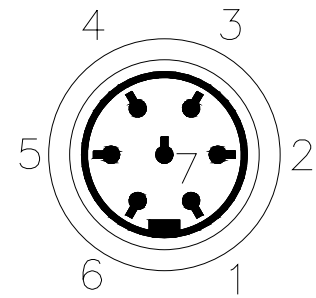
DIP-SWITCH for selection of velocity and serial protocol when μGRAPH displayboard is connected to external control systems (PC, REI2).

	→	1200 Baud OFF OFF OFF OFF
	→	2400 Baud ON OFF OFF OFF
	→	4800 Baud OFF ON OFF OFF
	→	9600 Baud ON ON OFF OFF
	→	19200 Baud OFF OFF ON OFF
	→	28800 Baud ON OFF ON OFF
	→	38400 Baud OFF ON ON OFF
	→	Radio ON ON ON OFF
		Dip switch 4: RS232/RS485 Position OFF: RS232 interface
		Dip switch 4: RS232/RS485 Position ON: RS485 interface

1.1.2 Connections

- **SUPPLY Input (7 pole Amphenol)**

- | | |
|---|-------------------------|
| 1 | Ground |
| 2 | Ground |
| 3 | Ground |
| 4 | External Supply (8-25V) |
| 5 | External Supply (8-25V) |
| 6 | External Supply (8-25V) |
| 7 | Remote on/off input |



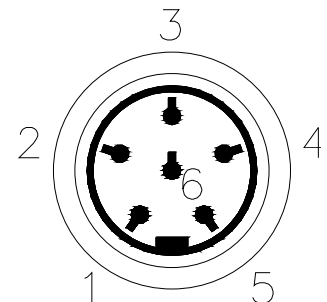
7 pole Amphenol cable connector

- **SERIAL 1 Input/Output (6 pole Amphenol)**

- | | |
|---|---------------------------|
| 1 | SERIAL 1 output RS232 TX |
| 2 | SYNC IN |
| 3 | SERIAL 1 input RS485 + RX |
| 4 | SERIAL 1 input RS485 - RX |
| 5 | Ground (cable braiding) |
| 6 | SERIAL 1 input RS232 RX |

- **SERIAL 2 Output (6 pole Amphenol)**

- | | |
|---|--------------------------|
| 1 | Serial 2 output RS232 TX |
| 2 | Serial 1 output RS232 TX |
| 3 | Serial 2 output RS485 + |
| 4 | Serial 2 output RS485 - |
| 5 | Ground |
| 6 | SYNC OUT |



6 pole Amphenol cable connector

- **SELF TIMING Input/Output (6 pole Amphenol)**

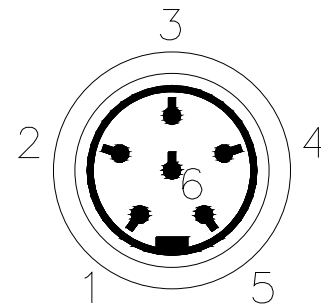
- | | |
|---|------------------|
| 1 | START signal |
| 2 | COIN signal |
| 3 | PARALLEL signal |
| 4 | REDLINE signal |
| 5 | AUX signal |
| 6 | GREENLINE signal |

- ***ANALOG Input (6 pole Amphenol)***

- | | |
|---|----------------|
| 1 | ANALOG 0 input |
| 2 | ANALOG 1 input |
| 3 | ANALOG 2 input |
| 4 | Not connected |
| 5 | Not connected |
| 6 | Not connected |

- ***DIGITAL Input/Output (6 pole Amphenol)***

- | | |
|---|------------------------|
| 1 | DIGITAL 0 input/output |
| 2 | DIGITAL 1 input/output |
| 3 | DIGITAL 2 input/output |
| 4 | DIGITAL 3 input/output |
| 5 | Ground |
| 6 | DIGITAL 4 output |

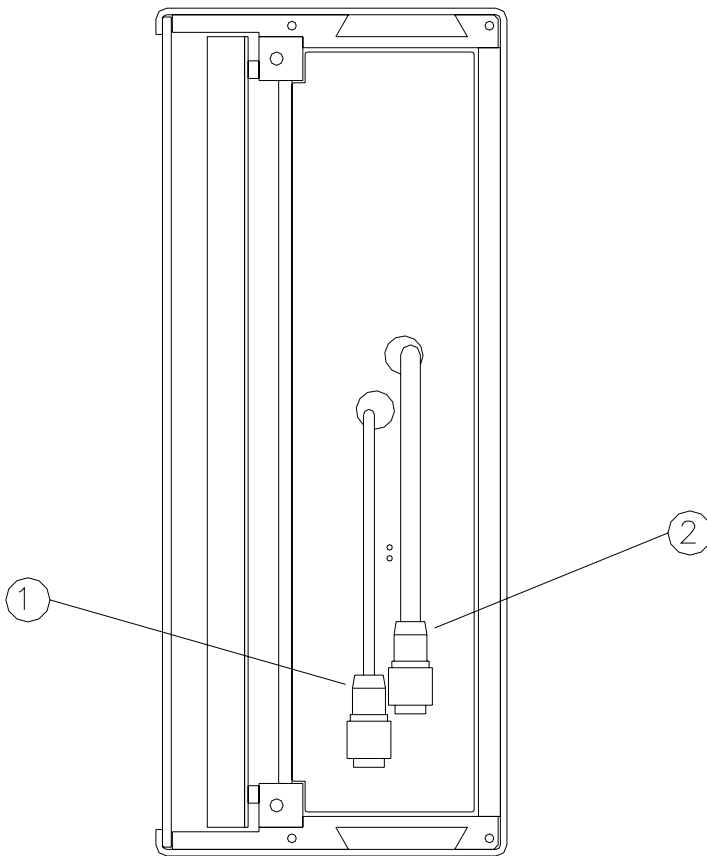


6 pole Amphenol cable connector

- ***START – STOP – LAP Input/Output (6 pole Amphenol)***

- | | |
|---|-----------------|
| 1 | START signal |
| 2 | External supply |
| 3 | Ground |
| 4 | LAP signal |
| 5 | STOP signal |
| 6 | AUX signal |

1.2 RIGHT SIDE PANEL

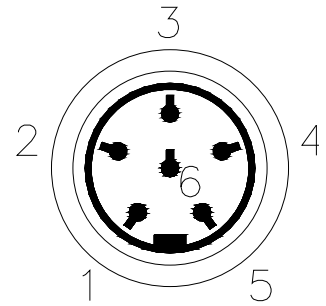


1. 6 pole Amphenol connector for control of next μGraph in sequence when two or more displayboards are connected on the same line
2. 7 pole Amphenol connector for power supply of next μGraph in sequence when two or more displayboards are connected on the same line

1.2.1 Connections

- **REAR SERIAL Output (6 pole Amphenol)**

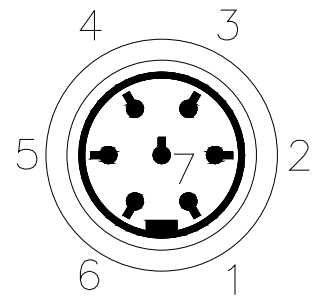
1	Not connected
2	SYNC OUT
3	Ground
4	Ground
5	Not connected
6	TX of REAR SERIAL



6 pole Amphenol cable connector

- **SUPPLY Output (7 pole Amphenol)**

1	Ground
2	Ground
3	Ground
4	External supply
5	External supply
6	External supply
7	Remote on/off output



7 pole Amphenol cable connector

1.3 POWER SUPPLY

Power can be supplied in three ways:

- By connecting the μGRAPH displayboard to the MICROGATE battery charger. In this way it is possible to supply a mains graphic displayboard and to keep the batteries charged at the same time. This guarantees perfect functioning also when the mains power supply is interrupted. The ACC062 adaptor accepts an input of alternate current at 50 or 60Hz, within a range of 100 and 240 Volts
- By using the internal batteries of the displayboard. In this case autonomy is usually above 30 hours of continuous functioning (depending on the type of display used).
- By connecting the displayboard to any continuous current supply (whether steady or not) between 10 and 30 Volts which is able to supply at least 30W peak power and about 4W average power. A car battery guarantees several days' autonomy.

If 2 or more μGRAPH displayboards must be powered, a single dedicated adaptor can be requested from MICROGATE.

Important note: the adaptor ACC062 for the μGRAPH displayboard **is not suitable for outdoor use**. Consequently Microgate does not accept any responsibility for damage to persons or things due to incorrect use of the adaptor.

1.3.1 Battery Recharge

If the batteries are low, either the *discharge/recharge* or the *immediate recharge* procedure can be carried out.

In the first case, the batteries are first discharged and only subsequently recharged. This allows the batteries to maintain their original capacity over a long period.

To select **discharge/recharge**, keep the **“START STOP (MODIFY CHARGE/DISCHARGE)” button on the control panel pressed down for at least 2 seconds with the displayboard switched off** after connecting an external power source to the connector SUPPLY. The operation will take from a minimum 7 hours to a maximum of about 10 hours, depending on the initial battery charge level.

If you choose immediate recharge instead, the operation will last about 7 hours. However, although this type of recharge takes less time, it should only be used in exceptional circumstances as it shortens the life of the batteries.

To select **immediate recharge**, keep the yellow **“LAP RESET (SETUP DIRECT CHARGE)” button on the control panel pressed down for at least 2 seconds with the displayboard switched off** after connecting an external power source to the connector SUPPLY.

In both recharge modes it is possible **to interrupt the process** by pressing the START STOP and LAP RESET keys simultaneously.

The LOW BATTERY led on the control panel tells you the battery charge status, the type of power source used and the recharge operation status when the battery is being recharged.

EXTERNAL SUPPLY	
STATUS	LOW BATTERY LED
<ul style="list-style-type: none"> ON/OFF Displayboard Batteries <i>Charged</i> 	Green – Green – Pause
<ul style="list-style-type: none"> ON/OFF Displayboard Batteries <i>Discharged</i> 	Green – Red – Pause

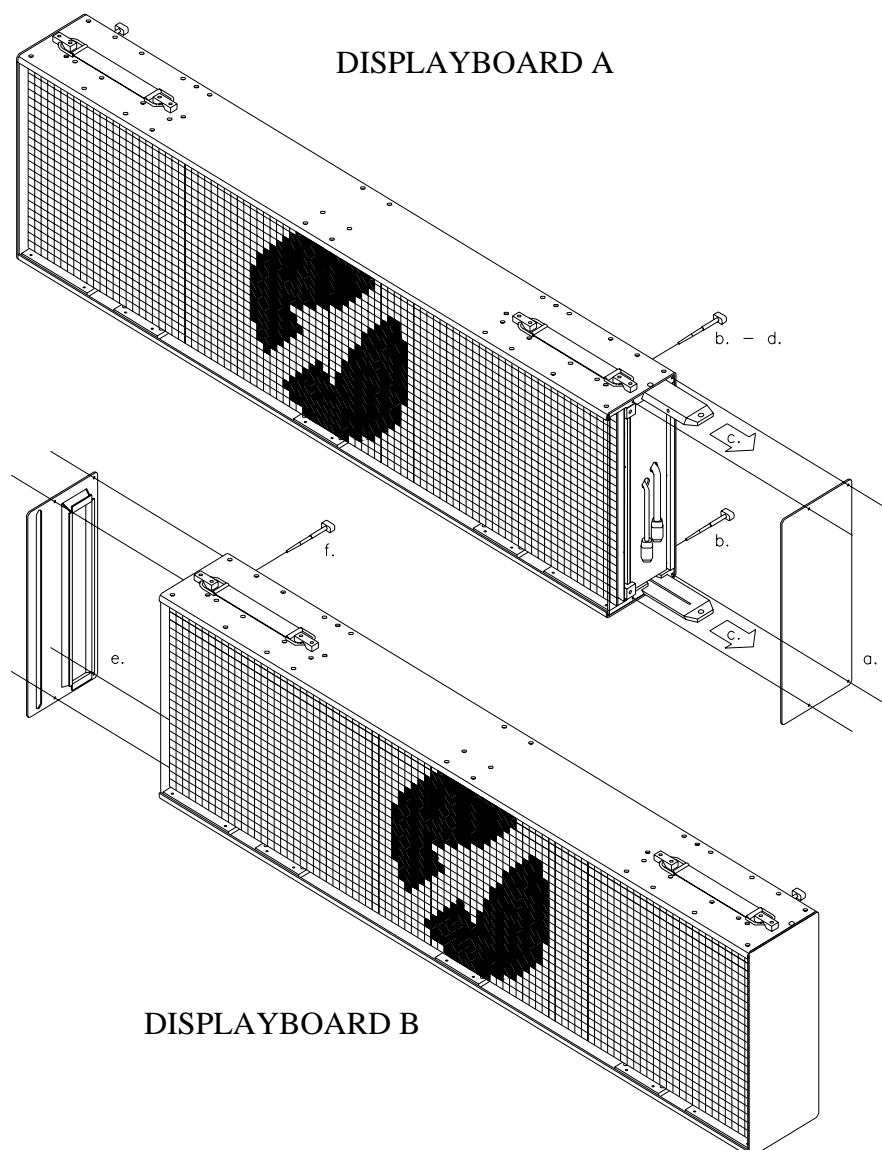
INTERNAL SUPPLY (BATTERY)	
STATUS	LOW BATTERY LED
<ul style="list-style-type: none"> OFF Displayboard Batteries <i>Charged or Discharged</i> 	OFF
<ul style="list-style-type: none"> ON Displayboard Batteries <i>Charged</i> 	Green – Pause – Green – Pause
<ul style="list-style-type: none"> ON Displayboard Batteries <i>Discharged</i> 	Red – Pause – Red – Pause

DISCHARGE/CHARGE	
STATUS	LOW BATTERY LED
<ul style="list-style-type: none"> Start of Discharging 	
<ul style="list-style-type: none"> Discharging Over – Start of Recharging 	Pause – Green – Pause – Green FAST
<ul style="list-style-type: none"> Recharging Over 	Green Continuous
DIRECT CHARGE	
STATUS	LOW BATTERY LED
<ul style="list-style-type: none"> Start of Recharging 	Pause – Green – Pause – Green FAST
<ul style="list-style-type: none"> Recharging Over 	Green Continuous

1.4 MODULAR ASSEMBLY

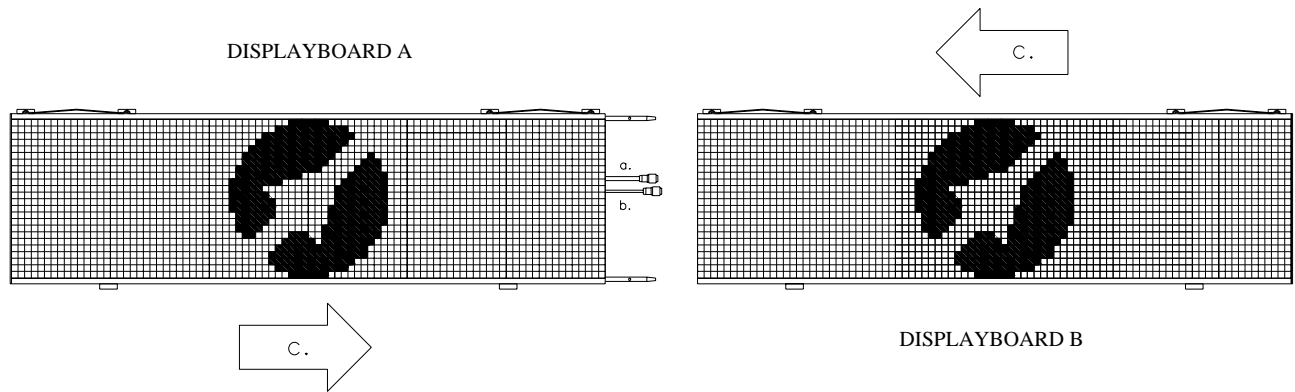
One of the greatest advantages of μGRAPH is that a number of displayboards can be put together to increase the length of the strings and images displayed. A single μGRAPH has a resolution of 24x90 pixels, while connecting up 3 displayboards in series, for example, would make it possible to show displays with a resolution of 24x270 pixels without spaces between one displayboard and the next. Each displayboard is distinguished by its position (line and column) defined by the rotating selector on the control panel. Consequently the selector of the first displayboard must be set at ROW 0 and COLUMN 0, the second, to its right, at ROW 0 and COLUMN 1 (and so on) before connecting up as described below.

This feature makes it possible to put together up to a maximum of 9 displayboards without taking apart their external casing, and is quite easy to do.



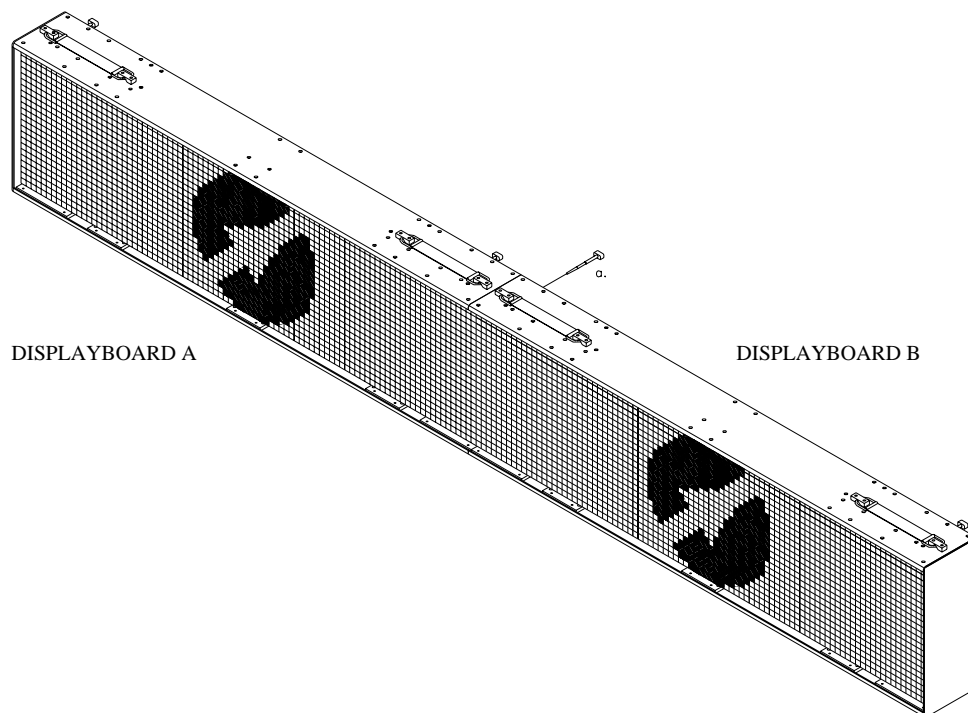
PHASE 1:

- a. Unscrew the 4 screws in the side panel on the right of DISPLAYBOARD A and remove the panel.
- b. Unscrew the 2 locking pins on the right of DISPLAYBOARD A.
- c. Pull out the two sliding plates of DISPLAYBOARD A as far as they will go.
- d. Screw in the 2 locking pins of DISPLAYBOARD A to block the sliding plates.
- e. Unscrew the 4 screws in the side panel on the left of DISPLAYBOARD B and remove the panel.
- f. Unscrew the 2 locking pins on the left of DISPLAYBOARD B.



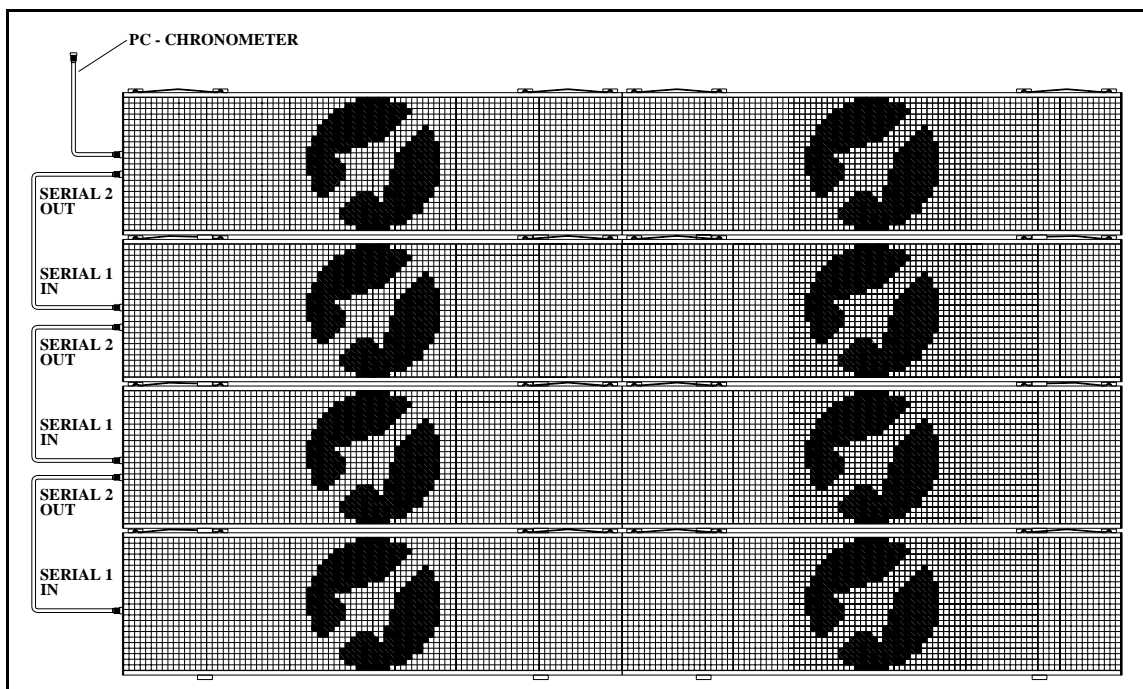
PHASE 2:

- a. Connect the power socket (7 pole amphenol, the cable with the larger diameter) of DISPLAYBOARD A to the external connector SUPPLY of DISPLAYBOARD B.
- a. b. Connect the REAR SERIAL socket (6 pole amphenol, the cable with the smaller diameter) of DISPLAYBOARD A to the SERIAL 1 connector of DISPLAYBOARD B.
- c. Bring the two displayboards together so that the sliding plates of DISPLAYBOARD A fit into the slot designed for them in DISPLAYBOARD B.



- a. Screw in the 2 locking pins on the left of DISPLAYBOARD B.

With this method it is also possible to join two or more lines of displayboards:



In this configuration, each line of displayboards (maximum 9 per line) must be powered separately through the first displayboard on the left. For data exchange between the lines, each first displayboard must be connected to the one below it as in the figure: the signal coming from SERIAL 2 of the displayboard above passes to SERIAL 1 of the displayboard below through a special connection cable.

It is important to set the position of the displayboard on the rotating selector of the control panel. In the example given, the first displayboard at the top left will have ROW 0 and COLUMN 0, the one to its right ROW 0 and COLUMN 1, the first in the middle on the left ROW 1 and COLUMN 0, the one to its right ROW 1 and COLUMN 1, the first at the bottom left ROW 2 and COLUMN 0 and finally the one to its right ROW 2 and COLUMN 1.

Another possibility is to join two or more lines without external casing. This will increase not only the length of the texts and images displayed, but also their width. Using 4 displayboards, for example, gives a resolution of 48x180 pixels without breaks. Also in this case the position of the displayboards must be set as for modular connections between two or more lines of μGraphs with external casing (see above).

In this way it is possible to connect up to 16 lines of 9 displayboards, each for a total of 810x384 pixels. To be able to exploit this second possibility you are advised to contact MICROGATE for the preparation of a special casing.

1.5 VIA RADIO SYSTEM

Some programs for the μGRAPH displayboard (see par. 0Program on p.18) make it possible to use the *Linkgate* radio system connected through *Decoder* or *DecRadio* to the RADIO connector situated on the μGRAPH control panel. Thanks to *Linkgate* it is possible to transmit START STOP and LAP signals from a long distance and, in Program 0 (Normal), serial data.

For further information about the *Linkgate* system, consult the appropriate REFERENCE MANUAL. In the following paragraphs, the possibility of using the via radio system will be indicated by a section **RADIO**.

NOTE: To be able to use the *Linkgate* system in, Program 3 (Speedmeter) and Program 7 (Lap Chronometer) the radio channel must be set in Program 0 (Normal) (see p.19) of the μGRAPH. To be able to transmit control commands in Program 0 (Normal) via radio the DIP SWITCH on the control panel must be set to RADIO (see par. 0 Serial Velocity Selector on p.6).

1.6 μGRAPH FIRMWARE

Every time it is switched on, μGRAPH displays the firmware version stored at that moment:

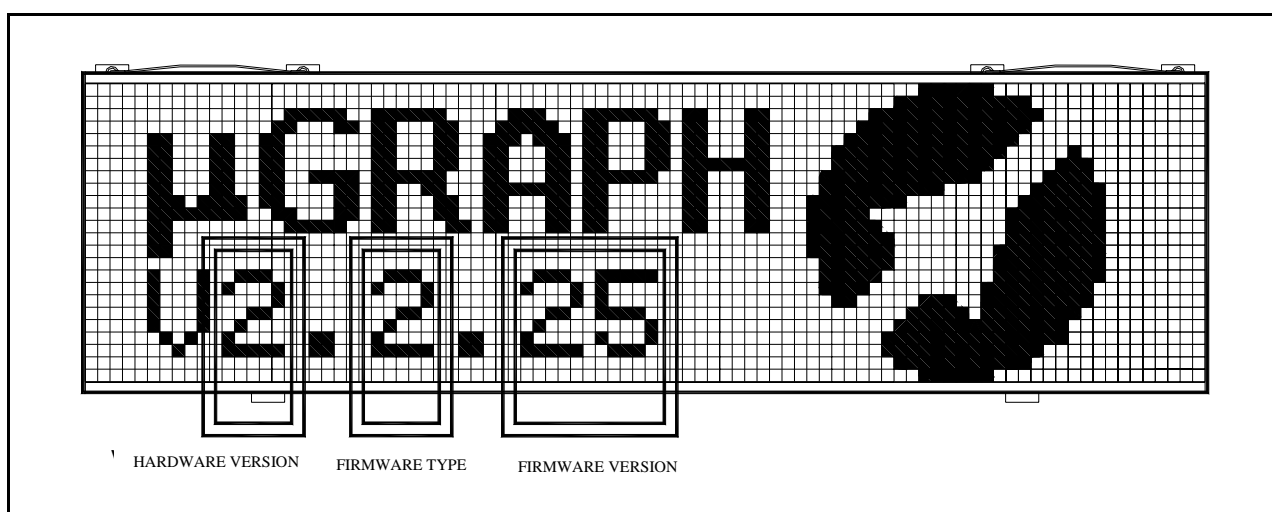


Figure 1

As can be noted in Figure 1, the numerical code of the firmware consists of 3 parts:

1. *Hardware Version*, the first number: indicates the version of the motherboard which controls the displayboard.
2. *Type of Firmware*, the second number, varies according to the programs that can be performed with the displayboard acquired:
 - 1 = Standard Firmware
 - 2 = Standard Firmware with Program 10 (Self Timing) enabled
3. *Firmware Version*, the last two numbers: it is important to provide the MICROGATE staff with this number if you require technical assistance.

1.6.1 Updating of Firmware

Free μGRAPH Firmware updating is possible by downloading the latest versions from the site <http://www.microgate.it> or requesting them from MICROGATE.

Once the update file has been obtained, the operations to be performed are simple:

- A. Switch off μGRAPH and set the rotating selectors ROW, COLUMN and PROGRAM to 15,15 and 15
- B. Press the START STOP (MODIFY) e LAP RESET (SETUP) buttons simultaneously and, while keeping them pressed down, switch on the displayboard (attention, the power supply must be disconnected before switching on the displayboard); the led on the displayboard should slowly blink red-green.
- C. Connect the PC serial to the μGRAPH SERIAL 1 connector (using the 20m CAB010 cable or the 2m CAB001)
- D. From the PC run the uFlasher program containing the latest Firmware version. During programming, the LOW BATTERY led on the displayboard turns ORANGE.
- E. After about 2 minutes programming is over (uFlasher shows the message "Device successfully programmed"). At this point, the led turns GREEN.
- F. The μGRAPH Firmware has been successfully updated. Now you can switch off the displayboard and change the settings on the rotating selectors ROW, COLUMN and ADDRESS.

Any error in programming is indicated by the LOW BATTERY led on the displayboard, which turns RED. In the unlikely eventuality that this should happen, simply repeat the procedure indicated above.

2 PROGRAMS

2.1 PROGRAM 0 (NORMAL)

By selecting the Program 0 (Normal) it is possible to command μGRAPH through the SERIAL 1 serial communication port or the RADIO connector.

The commands that can be given to μGRAPH are listed in par.0 Appendix A: μGRAPH Serial Frame on p.39. We strongly recommend that the less expert should exploit the versatility of the MICROGATE μBOARDS software to control μGRAPH correctly rather than making tedious attempts at direct programming.

Note: the commands identified as 'priority' or 'non-priority' (or 'strong' and 'weak') should be understood as being priority or non-priority in relation to the pause command. For example, a 'Weak reset' command given after a command pause will be carried out only at the end of the pause. A 'Strong reset' command, on the other hand, will be carried out directly.

RADIO: When the *Linkgate* system via radio is used in Program 0 (Normal), the type of radio signal used is different from that of the other programs and it is advisable not to exceed a transmitter/receiver distance greater than 150m.

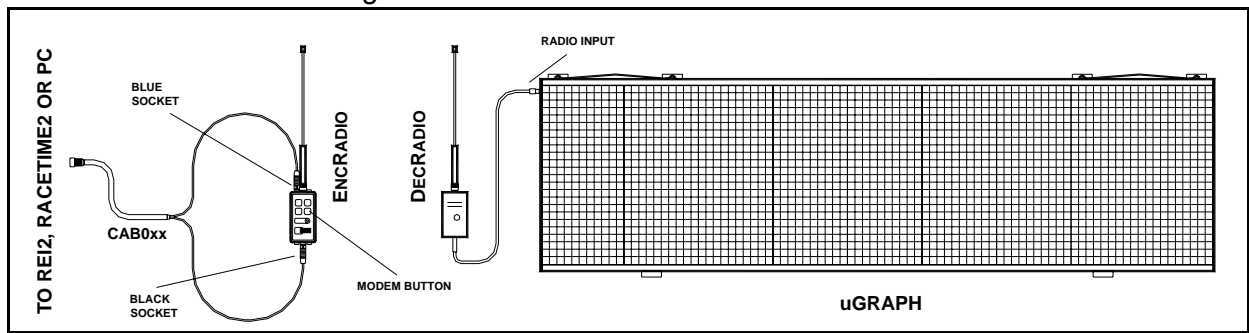


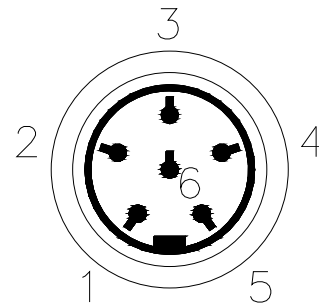
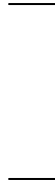
Figure 2

As can be seen in Figure 2, the *DecRadio* (or *Decoder*) is connected directly to the RADIO connector on the displayboard, whereas the *EncRadio* (or *Encoder*) is connected to a PC, *REI2* or *RACETIME2* with the appropriate cable (CAB073 for PC, CAB075 for *RACETIME2* and CAB071 with *CONNECTION BOX* for *REI2*). To begin communication, the MODEM button on *EncRadio* must be rhythmically pressed 3 times. Data transmission will take place at a velocity of 1200 bit/s.

If 2 or more μGraphs commanded via Radio are being used, a special connector (ACC087) must be connected to SERIAL 1 of the first displayboard. Without this connector pins 1 and 6 of the Amphenol must be bridged.

- SERIAL 1 Input/Output (6 pole Amphenol)**

1	SERIAL 1 output RS232 TX
2	SYNC IN
3	SERIAL 1 input RS485 + RX
4	SERIAL 1 input RS485 - RX
5	Ground (cable braiding)
6	SERIAL 1 input RS232 RX



6 poles Amphenol cable connector

Setup

In Program 0 (Normal), setup allows you to re-initialize all μGRAPH parameters to standard values and to set the first column displayed on the displayboard. The latter configuration makes it possible to use two or more displayboards placed side by side. For example, if the displayboard is the second element of the line, the first column will have to be set to 9.

Keep LAP-SETUP pressed for at least two seconds to enter Setup

Font: **SMALL**

Set the Font type required with START-MODIFY (SMALL 6x7 pixels, MEDIUM (proportional medium) 10xvariable pixels, HUGE 22x14 pixels, SPECIAL 24x14 pixels, MED.FIXED (non-proportional medium 10x7 pixels))

Press LAP-SETUP

Font: *SMALL*

X offset: **10**

Offset the text displayed towards the right in relation to the left edge with START-MODIFY (from 0 to 89)

Press LAP-SETUP

Font: *SMALL*

X offset: 10

Radio Ch.= **10**

Set the Radio channel with START-MODIFY (from 0 to 127 except channel 55)

Press LAP-SETUP

Green: *INITIALIZE*

Press START-MODIFY to confirm, LAP-SETUP to exit without initializing

Sure ? (Green)

Press START-MODIFY to confirm, LAP-SETUP to exit without initializing

2.2 ***PROGRAM 1 (MEMORY PROGRAM)***

Program 1 allows you to automatically run the previously set program. This program must be stored while μGRAPH is in **Program 0**. To store the program, send the command '*Program Start*', then the sequence of commands that make up the program, finally the '*Program End*' command. Besides the normal commands, a program can contain loops with instructions automatically repeated more than one time or an infinite number of times. The commands to be repeated must be preceded by the command '*Label*', which makes it possible to define the position of the program from which the commands to be repeated start. This command sequence must end with the command '*Loop-Goto*' which allows you to define the number of times the loop must be repeated.

2.3 PROGRAM 2 (CHRONOMETER)

In this mode μGRAPH works as a typical chronometer set to 1/100 of a second.

- With Start (manually, from input or via radio) the chronometer starts.
- With Lap (manually, from input or via radio) the chronometer shows an intermediate time for 5 seconds.
- With manual Start or Stop from input or via radio the chronometer stops.
- Now it is possible to set the chronometer to zero by pressing Lap.

If the chronometer is not set to zero, it will start from the value shown.

If the Autoreset time has been set to follow every Stop (or manual Start), the chronometer resets itself to zero after the preset time.

NOTE: If the printer is connected, times are printed, coupled to a progressive counter that is automatically set to zero every time mode 2 is selected or μGRAPH is switched off.

RADIO: Program 2 (Chronometer) can also be used with a *Linkgate* system via radio. After the radio channel has been correctly set (see par. 0 Program 0 (Normal) on p.19) the μGRAPH displayboard will also accept START, LAP and STOP signals coming from *Linkgate*.

Setup

It is possible to set the starting time of the chronometer.

Keep LAP-SETUP pressed for at least two seconds to enter Setup

Set Starttime

HH= 0

Set the hours with START-MODIFY
Press LAP-SETUP

Set Starttime

MM= 0

Set the minutes with START-MODIFY
Press LAP-SETUP

Set Starttime

SS= 0

Set the seconds with START-MODIFY
Press LAP-SETUP

Set Starttime

mm= 0

Set the thousandths with START-MODIFY
Press LAP-SETUP

Set Starttime

mm= 0

Autores. Time= 0

Set the automatic Reset time with START-MODIFY (in seconds). A time of zero disables the Autoreset function.
Press LAP-SETUP

The chronometer is now stopped on the set time, ready to start.

2.4 PROGRAM 3 (SPEEDMETER)

This mode allows you to measure the speed on the basis of any length. The speed is calculated on the basis of the measurement of the time interval between two **LAP-STOP input or via radio or manual LAP-START** impulses. So you need only place two photocells at the desired distance and connect them to the Lap and Stop inputs. If the bidirectional mode has been set, the measurement base can be run in both directions. Bidirectional mode is not recommended if it is not essential. The system is able to manage up to 20 transits at the same time in the measurement base.

If a delay has been set for the activation of the stored program (see "Setup" below), when this time is completed after the last measurement made, the display of the sequence stored as program is automatically started. This auxiliary function allows automatic display of information or advertising during the pauses between transits.

If the printer is connected, the speeds are printed, coupled to a progressive counter which is automatically set to zero every time you enter mode 3 or μGRAPH is switched off.

NOTE: obviously, speed measurement precision depends on the accuracy with which time is measured on the measurement base. To have a precision of 0.025 Km/h up to speeds of 130 Km/h, you need only place the photocells at least 10 m apart (using MICROGATE photocells). Increasing the distance increases measurement precision.

RADIO: As well as giving the manual LAP and START signals or input LAP or STOP, a *Linkgate* system via radio can be used. In this case the following options are available:

- A. Use of 2 *Polifemo* photocells and 2 *Encoders* or *EncRadios*. The signal of the first *EncRadio* must be set on LAP (any), and that of the second on STOP.

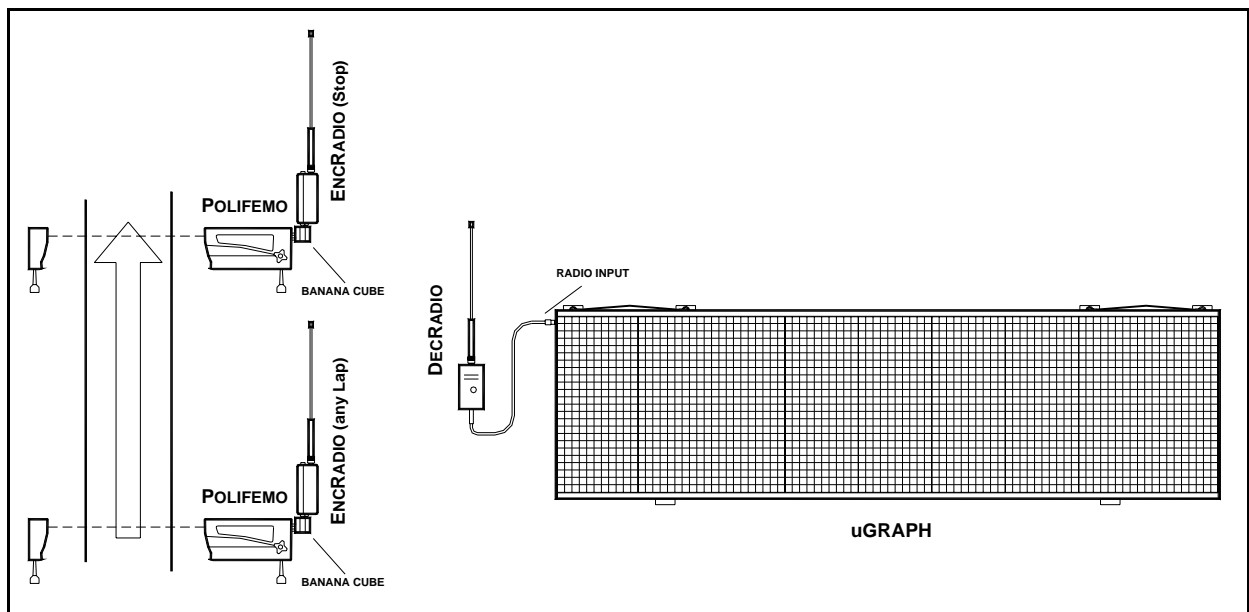


Figure 3

In the example shown in Figure 3, 2 *Polifemos* connected to *EncRadio* through *Banana Cube* have been used.

It is important to point out that if the *EncRadios* (or *Encoders*) have been set on LONG transmission signals, the traveling time of the length base cannot be less than 3 seconds while the time cannot be less than 1 second if SHORT signals are used.

- B. Use of 2 *Polifemo* photocells and 1 *Encoder* or *Encradio*. The first photocell must be connected (2 metre CAB050 cables or 20 metre CAB048 cables) to the Red and Black banana jacks of the *Encoder* and the second to the Green and Black banana jacks. The rotating selector for the selection of the signal on the *Encoder* must be set to *LAP E*. With this option it is not possible to exploit the bidirectionality of the system or to have more than one competitor in the measurement base.

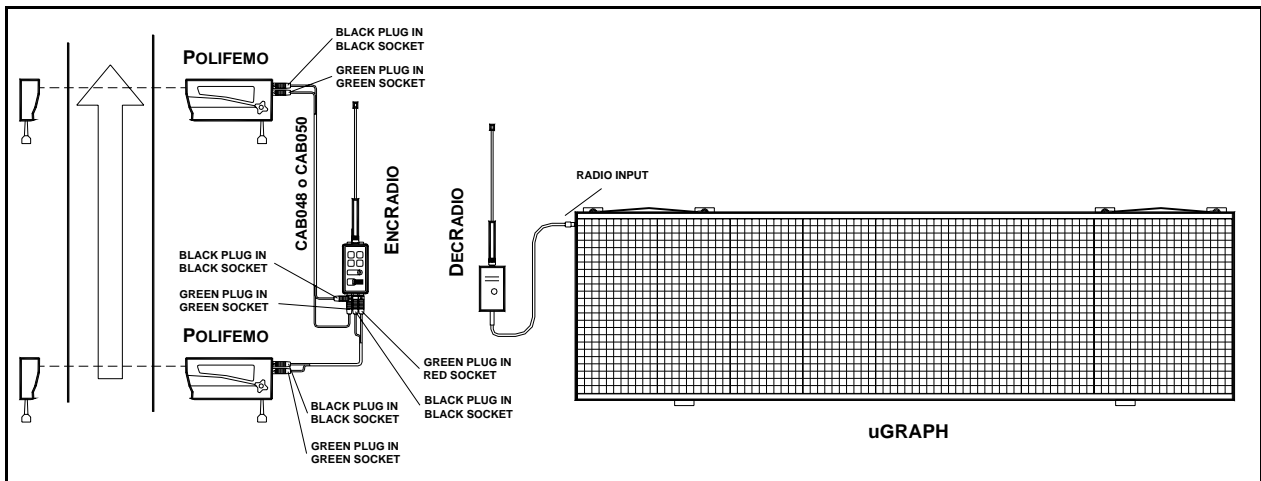


Figure 4

Setup

It is possible to set the length of the measurement base, the speed unit, the minimum and maximum speed allowed, the mono or bidirectional mode and the time lag with which the display program is automatically activated.

Keep LAP-SETUP pressed for at least two seconds to enter Setup

Base Length

Km 0

Set the kilometers with START-MODIFY
Press LAP-SETUP

Base Length

Km 0 m 0

Set the meters with START-MODIFY
Press LAP-SETUP

Base Length

Km 0 m 0 cm 0

Set the centimeters with START-MODIFY
Press LAP-SETUP

Base Length

Km 0 m 0 cm 0

Speed Unit: KMH

Edit using START-MODIFY (it is possible to choose from kilometers/hour, miles/hour, knots, meters/second).

Press LAP-SETUP

MINSpeed 1KMH

Set minimum speed using Start-Modify (0=no checks are made; another measurement unit can appear instead of "Kmh")

Press LAP-SETUP

MINSpeed 1KMH

MAXSpeed 5KMH

Set maximum speed using Start-Modify (0=no checks are made; another unit can appear instead of "Kmh")

Press LAP-SETUP

MINSpeed 1KMH

MAXSpeed 5KMH

Bidirectional= 0

Set bidirectional mode using START-MODIFY (0=No 1=Yes)

Press LAP-SETUP

Program Delay

MM= 0

Set the minutes with START-MODIFY

Press LAP-SETUP

Program Delay

SS= 0

Set the seconds with START-MODIFY

Press LAP-SETUP

NOTE: Minimum and maximum speeds refer to the unit currently set.

2.5 PROGRAM 4 (COUNTDOWN)

In this mode μGRAPH simulates a timer for the start. The beeper is activated at -10 seconds, -5, -4, -3, -2, -1 and 0 seconds from the set start time. Normally, the built-in beeper is too weak. You are therefore advised to connect the loudspeaker to the external socket on the side panel. The start device (starting gate or other) should be connected to the START-STOP-LAP-INPUTS input. At each start the starting time (minutes, seconds and thousandths) and the deviation in minutes, seconds and thousandths relative to the scheduled starting time (with the sign - for early start, + for delayed start) are displayed in sequence.

NOTE: the first start is given at the first net minute shown after Program 4 (Countdown) has been activated.

Setup

The time intervals between successive starts, the green light time and the time displayed can be pre-set (so as to synchronize the internal clock with other devices, usually the main chronometer). The period between each start is set to 0 and the countdown from -10 seconds starts when the LAP-SETUP key is pressed (or when the Lap input is activated).

In this way the start sequence can be set manually. In this case deviation from the scheduled start time is neither displayed nor printed.

Keep LAP-SETUP pressed for at least two seconds to enter Setup

Cycle:MM= 1 Set the minutes between each start with START-MODIFY
Press LAP-SETUP

Cycle:SS= 30 Set the seconds with START-MODIFY
Press LAP-SETUP

Cycle:SS= 30
Greentime(s) = 6 Set the seconds of green light time with START-MODIFY
Press LAP-SETUP

Set Sync.time
HH = 2 Set the hours with START-MODIFY
Press LAP-SETUP

Set Sync.time
MM = 44 Set the minutes with START-MODIFY
Press LAP-SETUP

Set Sync.time
SS = 1

Set the seconds with START-MODIFY
Press LAP-SETUP

Set Sync.time
mm = 537

Set the thousandths with START-MODIFY
Press LAP-SETUP

Now μGRAPH waits for a START (from key or input) for synchronization.

Set Sync.time
02:44:01
Start to Sync.

Press START-MODIFY or send input START signal

NOTE: when setting the time for synchronization, μGRAPH shows the time at which the setting has begun. If no value is modified, time is not changed and continues to run as if Setup had not been used. This makes it possible to edit the other parameters without losing synchronization.

2.6 PROGRAM 5 (INTERNAL CLOCK)

This mode allows you to display the time on the μGRAPH internal clock.

Setup

It is possible to set the date and time of the internal clock.

NOTE: During time setting, μGRAPH shows the time at which the setting began. If no value is modified, the time is not changed and runs as if Setup had not been used.

Keep LAP-SETUP pressed for at least two seconds to enter Setup

Set R.T. Date

day = 1

Set the day with START-MODIFY
Press LAP-SETUP

Set R.T. Date

daynum = 1

Set the day of the week with START-MODIFY
(1 Sunday, 2 Monday,..., 7 Saturday)
Press LAP-SETUP

Set R.T. Date

month = 1

Set the month with START-MODIFY
(1 January, 2 February, ..., 12 December)
Press LAP-SETUP

Set R.T. Clock

HH = 0

Set the hours with START-MODIFY
Press LAP-SETUP

Set R.T. Clock

MM = 0

Set the minutes with START-MODIFY
Press LAP-SETUP

Set R.T. Clock

SS = 0

Set the seconds START-MODIFY
Press LAP-SETUP

2.7 *PROGRAM 6 (INTERNAL CLOCK & DATE)*

This mode allows you to display the time and date on the μGRAPH internal clock.

Setup

It is possible to set the date and time of the internal clock. See Program 5 (Internal Clock) for a detailed explanation.

2.8 PROGRAM 7 (LAP CHRONOMETER)

Program 7 allows lap times timing. At each Start or Stop impulse (indifferently) the chronometer takes the time from the previous impulse and restarts automatically from zero. Time continues to be displayed for 8 seconds, then the running time appears again. The input and Lap key reset the chronometer to zero.

NOTE: If the printer is connected, times coupled with a progressive counter which is automatically set to zero every time Program 2 (Chronometer) is entered or μGRAPH is switched off, are printed.

RADIO: As well as giving the manual or input START, STOP and LAP signals, a *Linkgate* system via radio can be used (after correctly setting the radio channel in the menu of Program 0 (Normal)). The displayboard accepts any LAP signal.

Setup

It is possible to set the disactivation time of inputs after an impulse (holdoff time).

Keep LAP-SETUP pressed for at least two seconds to enter Setup

Holdoff Time

SS = 0

Set the seconds with START-MODIFY
Press LAP-SETUP

Holdoff Time

mm = 0

Set the thousandths with START-MODIFY
Press LAP-SETUP

2.9 *PROGRAM 9 (TEST)*

Program 9 (Test) is used to check the correct functioning of Pixels: the displayboard becomes alternately yellow and black. If the displayboard is exposed to temperatures lower than -15°C before being used, it is advisable to leave it switched on with this program inserted (for example, outdoors at night in high mountains).

2.10 PROGRAM 10 (SELF TIMING)

NOTE: This mode is available only on displayboards purchased with the Self-Timing option.

2.10.1 Starting Coin Box

The Starting coin box must be connected to the starting gate by connecting the special cable to the "GATE" socket on the bottom of the coin box and to the starting gate (black and green sockets). The coin box must also be connected to the finish through the "LINE" connector. For the connection between start and finish use a four-pole cable (the only specification for the cable: the total resistance of each cable should be less than 50 ohm - for example, for a 1000 m line, cables with a section of 0.25 mm² or more are sufficient). The jacks supplied must be connected to the ends of the cable, connecting poles 1, 2, 4, 6 of the jacks one at a time. Poles 3 and 5 are not used.

The third socket on the coin box is for powering a self-regulating warming resistance inside the coin box itself. This prevents the blocking of the mechanical parts of the coin box when wet or snow-covered coins are used and the external temperature is particularly low. Although it is not normally necessary to power the resistance, you are strongly recommended to do so. The resistance must be powered at 24V (either direct or alternate). Consumption is high at the beginning (200W max). Then it stabilises at about 20W (exact consumption depends on the external temperature). The two resistance poles are connected to pins 1+2 (short-circuited) and 4+5 (short-circuited) of the "HEATING" jack.

NOTE: It must be stressed that if the warming resistance is not used, it is not necessary to power the coin box.

2.10.2 Finish displayboard

Connect the line from the Start (see previous paragraph) to the SELF-TIMING socket of THE displayboard with the jack supplied.

Connect the photocell to the START-STOP-LAP INPUTS socket of the displayboard with the cable supplied. If you wish to take the exit speed, the intermediate time photocell must also be connected. Consequently a suitable wire must be used with a connection box to connect the start and intermediate time photocells.

With regard to power supply, remember that there are three different ways of powering the MICROGATE Self-Timing (see also par. 1.3 Power supply on p.9):

- A. By connecting the displayboard to the MICROGATE battery recharger/supply unit. In this way the Self-Timing is powered from the mains supply and simultaneously the batteries are kept charged by a trickle current. This guarantees perfect operation even if the mains supply is interrupted.
- B. By connecting the displayboard to any direct current source (whether stabilised or not) between 10 and 40 Volts, able to provide at least 4W peak power. A car battery guarantees a few days of autonomous use.
- C. By using the batteries built into the displayboard. In this case it is necessary to recharge the batteries daily with the special battery recharger.

2.10.3 Printer

It is possible to connect a printer with a built-in ticket cutting device to MICROGATE Self-Timing. The printer must be connected to the SERIAL 2 port on the side panel of μGRAPH.

At the finish, for every competitor a card is printed for him/her to take. On the card the following information appears:

- Two lines pre-set by the user (see below)
- Date, time and the competitor's progressive number
- Competitor's time
- Best race time
- Competitor's exit speed (if the intermediate photocell has been installed)
- Best exit speed

The progressive number, the best time and the best speed are reset to zero by switching off μTAB or by passing to a mode different from Program 10.

To set the first two lines which appear on the printer it is necessary to use a Personal Computer and send the appropriate command to μGRAPH (on this subject, see par. 3.1.1 μGRAPH Serial Protocol – Self Timing on p.40). The operation is easy and immediate if you use the MICROGATE μBOARDS program.

2.10.4 Functioning of Self-Timing Systems

To activate Self-Timing just connect the system as previously described and switch on the displayboard (Power switch), making sure that the "Program" switch is on 10 (Self-Timing).

The system starts functioning automatically when the first coin is inserted. The light on the coin box can have three states:

- Red: track stopped (any possible start has no effect)
- Green: track free, the athlete can start
- Blinking Red/Green: track free, but less than 10 seconds are left to start.

The green light is coupled to a free track beeper. The beep becomes more frequent when less than 10 seconds are left to start (blinking Red/Green).

After every start the track can be stopped for a time which can be changed as desired (see next paragraph), even if there are credits left. During this time the light remains red, and no start made will be considered. The light remains red even if there are four competitors on the track simultaneously.

If a competitor falls and does not finish the run, his/her time is automatically cancelled after a maximum time that can be changed as desired (see next paragraph).

It is also possible to set a minimum race time under which Stop signals are not accepted. This minimum time has two functions. First it serves the purpose of eliminating "impossible" times (obtained, for example, if all the gates are "missed"); secondly, it prevents the time of a competitor who has abandoned the race from being assigned to another competitor who has overtaken him/her.

NOTE: It is not necessary to wait until the track is free before inserting the coins. The system automatically allows the number of transits that have been paid.

2.10.5 Parameters setting

When you enter the Self-Timing program, or when the displayboard is switched on, the question "Setup?" appears for about 3 seconds. If during this period the Lap key (Setup) is kept pressed for at least two seconds, you access the parameters which regulate Self-Timing. The settings available are listed below.

- | | |
|---|--|
| <i>Max. Time:MM= <u>1</u></i> | Setting of minutes of the maximum time of the race after which the racer is presumed to have fallen (the chronometer resets itself to zero or passes to the timing of the next competitor).
Press LAP-SETUP |
| <i>Max. Time:SS= <u>1</u></i> | Set the seconds with START-MODIFY
Press LAP-SETUP |
| <i>Max. Time:SS= 1</i>
<i>Min. Time:MM= <u>0</u></i> | Setting of minimum minutes of race time under which the Stop impulses are not accepted
Press LAP-SETUP |
| <i>Max. Time:SS= 1</i>
<i>Min. Time:SS= <u>0</u></i> | Set the seconds with START-MODIFY
Press LAP-SETUP |
| <i>Max. Time:SS= 1</i>
<i>Min. Time:SS= 0</i>
<i>Greentime:MM= <u>1</u></i> | Setting of the time each racer has for the start (green light time), including the 10 seconds of blinking light.
NOTE: the maximum time allowed is 9 minutes and 59 seconds. Two values have a special meaning: - 10 minutes and 0 seconds: the light remains green for an infinite time after each enablement until the enablement is used with a start.
- 0 minutes and 0 seconds: the track is always free and coins do not need to be inserted. This setting is useful when you want to use the system to time a race, or when the payment of the races is not necessary or is managed by other devices. The light turns red only after each start for the minimum time between one start and the next. |
| <i>Max. Time:SS= 1</i>
<i>Min. Time:SS= 0</i>
<i>Greentime:SS= <u>1</u></i> | Set the minutes with START-MODIFY
Press LAP-SETUP |
| <i>Min Startdiff</i>
<i>MM= <u>0</u></i> | Setting of minimum time between two starts. During this time the light is red and starts are not accepted even if there is a backlog of enablements
Press LAP-SETUP |

Min Startdiff
SS= 0

Set the seconds with START-MODIFY
Press LAP-SETUP

Base Length
Km 0

Setting the kilometers of the distance between the intermediate time and finish photocells for speed measurement with START-MODIFY.
Press LAP-SETUP

Base Length
Km 0 m 0

Set the meters with START-MODIFY
Press LAP-SETUP

Base Length
Km 0 m 0 cm 0

Set the centimeters START-MODIFY
Press LAP-SETUP

Base Length
Km 0 m 0 cm 0
Speed Unit: KMH

Edit using Start-Modify (it is possible to choose from kilometers/hour, miles/hour, knots, meters/second).
Press LAP-SETUP

Program Delay
MM= 0

Set the delay in minutes of re-execution of the cycle with START-MODIFY
Press LAP-SETUP

Program Delay
SS= 0

Set the seconds with START-MODIFY.

N.LINEFEEDS 0

Setting of the length of the paper that comes out of the printer (optional) to set the correct length of the ticket - Edit using START-MODIFY.
Press LAP-SETUP

NOTE: The setting of Self-Timing parameters by means of PC is not possible if μGRAPH is in Program 10 (Self Timing). In this mode the only command accepted is 'Run Hardware Program' (see 3.1 Appendix A: Displayboard Serial protocol on p.39). Go to Program 0 (Normal) before sending the parameters.

2.10.6 Default value of the Self Timing editable parameters

When μGRAPH is delivered or after each global initialization (see 2.10 Program 10 (Self Timing) p.19), the configurable parameters are automatically set to the following values (often suitable for many applications):

- Maximum Race Time 1' 30"
- Minimum Race Time 0' 0" (Stop is always enabled)
- Green Light Time 1'
- Minimum Start between two starts 0' 20"
- Speed Base Length 10 meters
- Speed unit Km/h
- Delay Time of Program Activation 0' 15" (Attention: obviously, the program does not start if it has not been previously stored)
- Printer paper length 0

2.10.7 Some suggestions

- Avoid reducing the minimum time between two starts excessively as it can be dangerous to have racers starting at very short time intervals.
- Also avoid excessive reduction of the green light time, that is, the time that each racer has for starting. Although the reduction of this parameter makes it possible to reduce the waiting time at the start, too short a time can be unpleasant for customers, who find themselves obliged to rush their starts.
- If the photocell is used to take the exit speed, place it at least 8 - 10 meters before the finish photocell to guarantee the necessary measurement precision (see also general instructions, par.2.4 Program 3 (Speedmeter) on p.23).

2.11 DEFAULT VALUES OF EDITABLE PARAMETERS

When μGRAPH is delivered or after each global initialization (see 2.10 Program 10 (Self Timing) p.19), the configurable parameters are automatically set to the following values (often suitable for many applications):

Program 0 (Normal) page 19

- Font SMALL
- X Offset 0
- Baud 1200 bit/s
- Protocol RS232
- RadCh 0

Program 2 (Chronometer) page 22

- Starting Time 0
- Autoreset Time 0 (disabled)

Program 3 (Speedmeter) page 23

- Speed base length 10 meters
- Speed measurement unit Km/h
- Minimum speed 3
- Maximum speed 0 (no control is made)
- Bidirectionality 0 (No)
- Program activation delay 0' 15" (Attention: the program does not start if it has not been previously stored)

Program 4 (Countdown) page 26

- Start Cycle 0' 30"
- Green light time 6" (from -3 to +3 in relation to the scheduled time)

Program 7 (Lap Chronometer) page 30

- Handoff time 0.2 sec.

NOTE: Also the time and date are preset to particular values.

3 APPENDIX

3.1 APPENDIX A: μGRAPH SERIAL FRAME

(8 BIT, 1 STOP, PARITY NONE)

The serial velocity and the type of protocol used by the displayboard must be set with the Dip-Switch on the control panel. The data transmitted consists of 8 bits of information and 1 bit of Stop, without parity check. There is no hand-shaking.

The μGRAPH protocol is based on 2 standard records:

- textual, which allows the display of simple strings of text
- graphic, which allows the display of strings of text and images

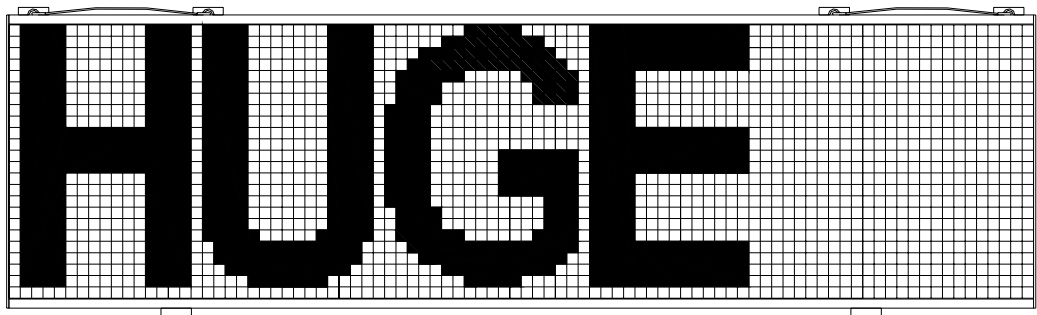
3.1.1 Text Frame

When textual records are used, the μGRAPH displayboard is divided up into a number of sections depending on the height of character employed. The textual record will be fully compatible with that of the μTAB alphanumeric displayboard.

The character used by the displayboard can be set manually by means of the *Setup* of program 0 (see Program 0 (Normal) on p.19), or the appropriate serial command.

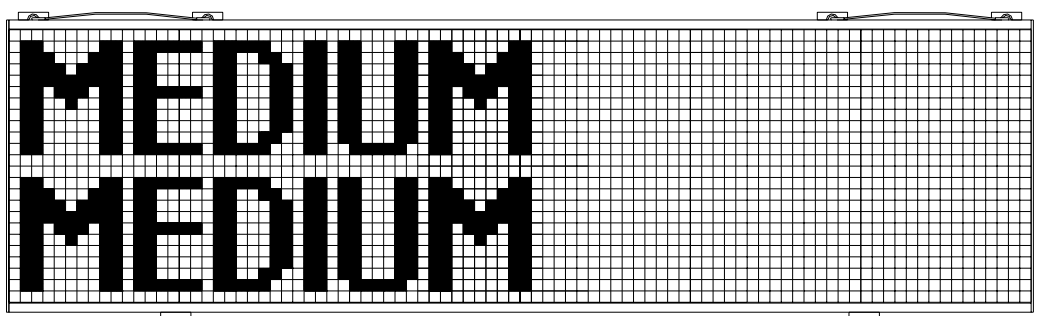
3 character heights can be used, and the display area of each μGraph will be divided up like this:

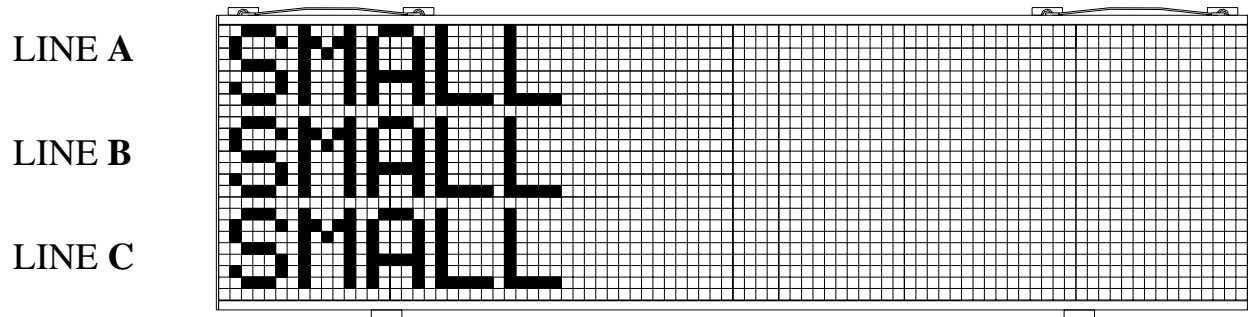
LINE A



LINE A

LINE B





As can be seen, when the HUGE character height is used, μGRAPH has a single line of display. If the MEDIUM character is used, the displayboard is divided into two parts (line A and line B). Finally, if the SMALL character is used, the displayboard is divided into 3 sections (line A, line B e line C).

It should be pointed out that when two or more μGRAPHS are connected in series, there is no break between one displayboard and the next, but, for example, when 3 μGRAPHS are used in series, strings up to a length of 270 pixels can be shown, compared with 90 for the single displayboard.

As well as height, another important characteristic of the fonts is width. Some fonts can be shown in both proportional and non-proportional mode (see *chap. Proportional and Non-Proportional Fonts* on p. 48).

3.1.1.1 Text Frame format and Command Table

The format of the text frame is as follows:

Field	Length	Conten.	Meaning
Start of Frame	1	ESC (0x1B)	Start of Command frame
Address	1	A...Q, ' '	Line identifier, Blank for broadcast
Command	1	(Any)	Command to be sent to Displayboard (see below)
Data	Variable	Variable	Optional data area of command
End of frame	1	ETX (0x03)	End of Command frame
Checksum	1	Variable	7-bit checksum made on whole frame

The table below gives the various commands which can be used in the command field:

Command	Command Code
• Date Display	A Dec. 65 - Hex 41h
• Program start	B Dec. 66 - Hex 42h
• Time setting sensitive to break	C Dec. 67 - Hex 43h
• Time setting not sensitive to break	c Dec. 99 - Hex 63h
• Break setting (it breaks the execution of following commands)	D Dec. 68 - Hex 44h
• Date setting	d Dec. 100 - Hex 64h
• Entry Point/Label for loops	E Dec. 69 - Hex 45h
• Program end	K Dec. 75 - Hex 4Bh
• Loop/Goto	L Dec. 76 - Hex 4Ch
• Internal clock time setting (Real Time Clock)	M Dec. 77 - Hex 4Dh
• Internal clock time display(Real Time Clock)	N Dec. 78 - Hex 4Eh
• Running string writing	O Dec. 79 - Hex 4Fh
• Stop running string	o Dec. 111 - Hex 6Fh
• Internal hardware program execution	P Dec. 80 - Hex 50h
• Self-Timing printer strings	p Dec. 112 - Hex 70h
• "Weak" displayboard reset (sensitive to Break)	R Dec. 82 - Hex 52h
• "Strong" displayboard reset (not sensitive to Break)	r Dec. 114 - Hex 72h
• Fixed string writing	S Dec. 83 - Hex 53h
• Parameters setup	s Dec. 115 - Hex 73h
• Display of set time	T Dec. 84 - Hex 54h

3.1.1.2 Syntax of Text Frame commands

3.1.1.2.1 DATE DISPLAY

Date display		
Command Code	‘A’	
Data		
Item	Length (bytes)	Notes
Position (column)	2	00 = first character on the left
Mode	1	0=disabling 1=GG/MM/AA 2=GG MMM AA

3.1.1.2.2 TIME SETTING SENSITIVE TO BREAK

Time setting sensitive to Break		
Command Code	'C'	
Data		
<i>Item</i>	<i>Length (bytes)</i>	<i>Notes</i>
HHMMSSCC	8	hours minutes seconds hundredths

3.1.1.2.3 TIME SETTING NOT SENSITIVE TO BREAK

Time setting not sensitive to Break		
Command Code	'c'	
Data		
<i>Item</i>	<i>Length (bytes)</i>	<i>Notes</i>
HHMMSSCC	8	hours minutes seconds hundredths

3.1.1.2.4 BREAK SETTING (IT BREAKS THE EXECUTION OF FOLLOWING COMMANDS)

Break setting (it breaks the execution of following commands)		
Command Code	‘D’	
Data		
<i>Item</i>	<i>Length (bytes)</i>	<i>Notes</i>
Delay	5	Delay duration in hundredths

3.1.1.2.5 DATE SETTING

Date setting		
Command Code	‘d’	
Data		
Item	Length (bytes)	Notes
Date	6	GGMAAA format
Day	1	1=Sunday 2=Monday ...

3.1.1.2.6 INTERNAL CLOCK TIME SETTING (REAL TIME CLOCK)

Internal clock time setting (Real Time Clock)		
Command Code	‘M’	
Data		
Item	Length (bytes)	Notes
HHMMSSCC	8	hours minutes seconds hundredths

3.1.1.2.7 INTERNAL CLOCK TIME DISPLAY (REAL TIME CLOCK)

Internal clock time display (Real Time Clock)		
Command Code	‘N’	
Data		
Item	Length (bytes)	Notes
Position (column)	2	00 = first character on the left
Mode	1	0 = disabling 1 = format HH:MM:SS 2 = format MM:SS 3 = format HH:MM 24h (ex. 15.25) 4 = format HH:MM 12h (ex. 3:25 PM)

3.1.1.2.8 RUNNING STRING WRITING

Running string writing		
Command Code	‘O’	
Data		
Item	Length (bytes)	Notes
Position (column)	2	00 = first character on the left
N° of columns involved	2	0 < n <= 81
Delay of string motion	3	In hundredths
String	<=255	Characters to be written

3.1.1.2.9 STOP RUNNING STRING

Stop running string		
Command Code	'o'	
Data		
Item	Length (bytes)	Notes
HHMMSSCC	8	hours minutes seconds hundredths

3.1.1.2.10 INTERNAL HARDWARE PROGRAM EXECUTION

Internal hardware program execution		
Command Code	‘P’	
Data		
Item	Length (bytes)	Notes
N° of program	2	00 = 1st program (as for switch)

3.1.1.2.11 SELF-TIMING PRINTER STRINGS

Self-Timing printer strings		
Command Code	‘p’	
Data		
Item	Length (bytes)	Notes
Row 1	35	1st string
Row 2	35	2nd string

3.1.1.2.12 "WEAK" DISPLAYBOARD RESET (SENSITIVE TO BREAK)

"Weak" displayboard reset (sensitive to Break)		
Command Code	‘R’	
Data		
Item	Length (bytes)	Notes
None		

3.1.1.2.13 "STRONG" DISPLAYBOARD RESET (NOT SENSITIVE TO BREAK)

"Strong" displayboard reset (not sensitive to Break)		
Command Code	'r'	
Data		
Item	Length (bytes)	Notes
None		

3.1.1.2.14 FIXED STRING WRITING

Fixed string writing		
Command Code	‘S’	
Data		
<i>Item</i>	<i>Length (bytes)</i>	<i>Notes</i>
Position (column)	2	00 = first character on the left
String	<=81	Characters to be written

3.1.1.2.15 PARAMETERS SETUP

Parameters setup		
Command Code	‘s’	
Data		
<i>Item</i>	<i>Length (bytes)</i>	<i>Notes</i>
Subcommand	1	Alphabetic character (see below)
Parameter	X	See below

Parameters Setup Subcommands

Countdown

A	999	Countdown duration - $11 < n \leq 500$ (0=-10 sec., manual)
B	999	Valid Start Time - $0 \leq n \leq 500$

Selftiming

C	999	Minimum time between two athletes - $10 < n \leq 500$
D	999	Maximum Track Time - $10 < n \leq 500$
I	999	Minimum Track Time - $n \geq 0$
E	999	Auto Program Time - $0 \leq n \leq 500$
F	9999999	Speed Base Length in mt. - $0 \leq n \leq 50000.00$
L	999	Green Light Time - $0 \leq n \leq 600$ (0=xxx - 600=always green)
M	999	Number of Line-feeds of printer paper - $0 \leq n \leq 255$
U	999	Unit (000=m/s 001=Kmh 002=mph 003=knt)

SpeedMeter

G	999	Auto Program Time - $0 \leq n \leq 500$
H	9999999	Speed Base Length in mt. - $0 \leq n \leq 50000.00$
u	999	Unit (000=m/s 001=Kmh 002=mph 003=knt)
S	999	Maximum Speed - $n \geq 0$
s	999	Minimum Speed - $n \geq 0$
d	999	Bidirectionality $0 \leq n \leq 1$

Normal

N	999	First column displayed - $0 \leq n \leq 81$
---	-----	---

ChronoLap

I	9999999	Handoff Time - $5 \leq n \leq 50000$
---	---------	--------------------------------------

3.1.1.2.16 DISPLAY OF SET TIME

Display of set time		
Command Code	‘T’	
Data		
Item	Length (bytes)	Notes
Position (column)	2	00 = first character on the left
Mode	1	0 = disabling 1 = format HH:MM:SS 2 = format MM:SS 3 = format HH:MM 24h (ex. 15.25) 4 = format HH:MM 12h (ex. 3:25 PM)

The following 4 commands are used for setting "programs" (series of operations to be performed in sequence):

3.1.1.2.17 PROGRAM START

Program start		
Command Code	‘B’	
Data		
Item	Length (bytes)	Notes
None		

3.1.1.2.18 PROGRAM END

Program end		
Command Code	‘K’	
Data		
Item	Length (bytes)	Notes
None		

3.1.1.2.19 ENTRY POINT/LABEL FOR LOOPS

Entry Point/Label for loops		
Command Code	‘E’	
Data		
<i>Item</i>	<i>Length (bytes)</i>	<i>Notes</i>
Label name	1	From 0 to 9

3.1.1.2.20 LOOP/GOTO

Loop/Goto		
Command Code	‘L’	
Data		
Item	Length (bytes)	Notes
Label name	1	From 0 to 9
Loop number	2	00 = infinite loop

NOTE: numerical parameters with more than one digit must be padded (on the left) with zeros if they occupy fewer characters than those fixed.

EXAMPLE: running string ("Microgate") on line A, starting from first column, number of columns involved 9, delay 30 hundredths:

ESC - A - **○** - 00 - 09 - 030 - Microgate - ETX - Chk

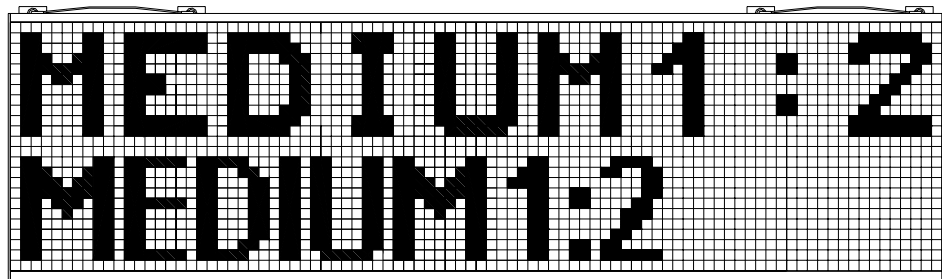
3.1.2 Proportional and Non-Proportional Fonts

In both textual and graphic frames, some fonts can be displayed in non-proportional and proportional mode:

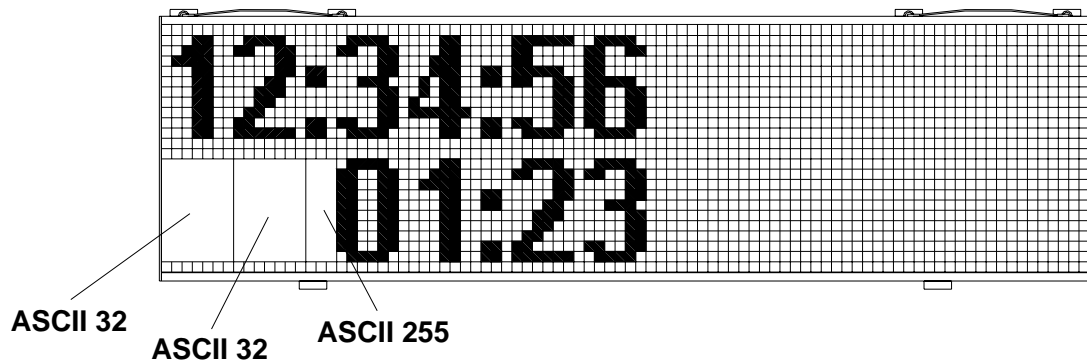
- non-proportional fonts have letters, figures, punctuation and spaces of the same width
- proportional fonts have:
 - figures of the same width
 - punctuation of the same width (less than that of the figures)
 - letters of variable width
 - space the same width as for figures
 - “short” space the same width as for punctuation and corresponding to the character ASCII 255

Font
Non-Proportional

Font
Proportional



The “brief” space of proportional fonts is very useful when times must be lined up on different lines:



As can be seen in the figure, to line up the time of the bottom line with that of the top line, two “normal” spaces and one “brief” space have been used.

3.1.3 Graphic Frame

The advantage of the graphic frame is that it allows you to display images and active objects as well as text strings.

The position of strings and images is not restricted by lines or columns. The positioning of each object will be completely free, will have as reference the upper-left corner of the μ Graph and be given in pixel. The objects themselves will have their highest point on the left as reference (unless a different setting is made).

To use the displayboard in graphic mode, commands must be sent to the identifier (see Address field) '@'. The first μ Graph will transmit the data to the others. If data is sent to the graphic displayboards with the address 'A', 'B' and so on, it will be interpreted as μ TAB commands and treated as such.

The format of the command frame is different for commands sent to the graphic displayboard, so it is important not to get the identifiers mixed up. At the start of the Data area 2 words are inserted with the coordinates in pixels of the starting point of the command and a byte containing the Binary Operation to be made. If a position parameter is used in the command for μ Tab, this will not be transferred but will be replaced by the new format.

NOTE: The Binary Operator value will not in fact be used for all commands (for example, for the PAUSE command). However, it must be sent for all graphic displayboard commands.

3.1.3.1 Graphic Frame format and Command table

The format of the frame for the graphic displayboard will therefore become:

Field	Length	Content	Meaning
Start of Frame	1	ESC (0x1B)	Start of command
Address	1	@ (0x40)	Identifier of Graphic Displayboard
Command	1	Variable	Command to be sent to Displayboard
Start of Horizontal Coordinate	2	0-809	max 9 displayboards placed side by side (the first column is the one furthest to the left)
Start of Vertical Coordinate	2	0-383	max 16 placed one on top of the other (the first line is the top one)
Binary Operation	1	0-4	See relative table below
Font	1	0-3	Binary code 0=Default 1=6x8 non proportional (SMALL) 2=12xVariable proportional (MEDIUM) 3=24xVariable proportional (HUGE) 4=24x15 'full size', only numeric (SPECIAL) 5=12x10 non proportional (MEDIUM FIXED) 6=24x13 'full size narrow', only num. (SPECIAL2) Note: by adding 128 (0x80) to the font identifier, alignment to the right is activated. In this case the start position is in relation to the top right corner of the field.
Data	Variable	Variable	Command optional data area
End of Frame	1	ETX (0x03)	End of Command
Checksum	1	Variable	7-bit checksum made on whole frame.

The table below gives the identifiers of the binary operator applied. 'Source' means the bitmap transferred with the command, and 'destination' the area of the displayboard on which it is placed.

Code	Operation performed
0	No Operation: Copies the pixels, writing over the previous status
1	NOT: Inverts the source values and copies them on the destination
2	AND: Only the active pixels on both the source and destination stay switched on
3	OR: Only the switched-off pixels on both the source and destination are switched off
4	XOR: The pixel at destination is inverted if the corresponding pixel at source is switched on.

NOTE: by adding **128 (80 hex)** to the Binary Operator, the command will be regularly processed, but the displayboard will **not be updated**. This allows to send several commands (e.g. several strings placed at different positions), updating the visualization just when the last command is received.

The various commands which can be used in the Command field of the graphic record are given below:

Command	Command Code
• Data display	A Dec. 65 - Hex 41h
• Font Selection	F Dec. 70 – Hex 46h
• Image Insertion	I Dec. 73 – Hex 49h
• Command of digital outputs	i Dec. 105 – Hex 69h
• set time display	N Dec. 78 - Hex 4Eh
• Writing of Moving string	O Dec. 79 - Hex 4Fh
• Resetting a Displayboard Area	Q Dec. 81 – Hex 51h
• Writing of fixed string	G Dec. 71 - Hex 4Ah
• set time display	T Dec. 84 - Hex 54h
• Active object disactivation	t Dec. 116 – Hex 74h

3.1.3.2 Active Objects

The display commands include “Active Objects”, that is, predefined objects which are managed autonomously by the graphic displayboard. Active objects can be of 4 different types:

- The internal time of the displayboard (Real Time Clock) in various formats: it is provided by the internal quartz clock of the displayboard, which functions also when power is off. It is usually synchronized to the time of day.
- The time of day in various formats: it is provided by the quartz precision clock of the displayboard which functions only when power is on. When switched on, it synchronizes itself with RTC
- Data in various formats
- Rolling texts

On every μGRAPH displayboard up to a maximum of 16 active objects can be displayed, each of which is characterized by an origin (coordinates x and y of the start pixel). If two active objects have the same origin, they can only be displayed one at a time.

The command for displaying active objects requires the use of a special “Graphic Header” (ESC - @ - command – x_start – y_start – binary operator – font).

3.1.3.3 Syntax of Graphic Frame commands

3.1.3.3.1 DATA DISPLAY

Data display – Active Object		
Command Code		‘A’
Data		
Item	Length (bytes)	Notes
Display format	1	1(binary)=DD/MM/YY 2(binariy=DD MMM YY

3.1.3.3.2 IMAGE INSERTION

This command is used to display Bitmap images on the graphic displayboard. Each bit of data placed at ‘1’ corresponds to a switched-on pixel in the image. The image is scanned vertically, with one column at a time being sent, aligned to the byte. No type of compression is used.

Image Insertion		
Command Code	‘I’	
Data		
Item	Length (bytes)	Notes
Dimension X	2	Horizontal Dimension of image
Dimension Y	2	Vertical Dimension of image
Image Data	?	Each vertical line is scanned and sent, aligned to the byte. The Least Significant bit refers to the highest pixel.

3.1.3.3.3 COMMAND OF DIGITAL OUTPUTS

Command of digital outputs		
Command Code	‘i’	
Data		
Item	Length (bytes)	Notes
Input/output control	1	Use bits from 0 to 3 to select the mode of digital I/Os from 0 to 3 (0 = output, 1 = input).
Value of digital outputs	1	Use bits from 0 to 4 to set the value on digital outputs from 0 to 4 (0 = OV, 1 = 5V).

3.1.3.3.4 INTERNAL CLOCK DISPLAY (RTC)

Display of internal clock (RTC) – Active Object		
Command Code	‘N’	
Data		
Item	Length (bytes)	Notes
Display Format	1	1 (binary) = HH:MM:SS 2 (binary) = MM:SS 3 (binary) = HH:MM (24h) 4 (binary) = HH:MM (12h)
Delay	4	Time ahead or behind the setting of the internal clock, in thousandths of a second

3.1.3.3.5 WRITING OF MOVING STRING

Writing of moving string– <i>Active object</i>		
Command Code	‘O’	
Data		
<i>Item</i>	<i>Length (bytes)</i>	<i>Notes</i>
Width of text	2	Width of text in Pixels (binary word)
Delay in display	2	Delay in running (Frame to Frame) in hundredths (binary word)
Width of display	1	Width of display in Pixels (binary)
Text	?	From 1 to 255 characters + 'null terminator'

3.1.3.3.6 WRITING OF FIXED STRING

Writing of fixed string		
Command Code		‘S’
Data		
Item	Length (bytes)	Notes
String	<=81	Characters to be displayed (with null terminator)

3.1.3.3.7 SET TIME DISPLAY

Set time display – Active object		
Command Code		‘T’
Data		
Item	Length (bytes)	Notes
Display format	1	1(binary)=HH:MM:SS 2(binary)=MM:SS 3(binary)=HH:MM (24h) 4(binary)=HH:MM (12h)
Lag	4	long integer (31 bit + sign) with time in front or behind indicated in relation to the internal clock (quartz precision), in thousandths.

3.1.3.3.8 ACTIVE OBJECT DISACTIVATION

Active object disactivation		
Command Code	‘t’	
Data		
Item	Length (bytes)	Notes
None	-	None given: the object is identified by its position

ATTENTION: when an active object is written over one in the same position, the original object is automatically disactivated.

3.1.4 Resetting a Displayboard Area

This command allows you to cancel just one area of the graphic displayboard.

The graphic displayboards form a single surface composed of the sum of their areas. This command cancels one part of the surface, irrespective of which displayboards are involved in the operation.

Resetting a Displayboard Area		
Command Code	'Q'	
Data		
Item	Length (bytes)	Notes
Dimension X		Horizontal Dimension of the area to be canceled
Dimension Y		Vertical Dimension of the area to be canceled

3.1.5 Font Selection

If you intend to use the μTab graphic displayboard in compatible mode, you must set the character to be displayed. This command sets the character for all the displayboards and prepares them to receive commands with an identifier other than '@'. When you switch on, the default font is 15x24 (TBD).

Font Selection		
Command Code		'F'
Data		
Item	Length (bytes)	Notes
None (use the font field of the graphic header to set the font)		Fonts: <ul style="list-style-type: none">• 48(30h): Font 6x8 (Equal to the one on the μTAB, 3 lines per displayboard., 15 characters per line)• 49(31h): Font 12xVariable (2 rows per displayboard, 11 characters per line)• 50(32h): Font 24xVariable (1 row per displayboard, 6 characters per line)• 51(33h): Font 24x15 (only numbers, 1 line per displayboard, 5 numbers and two punctuation marks per line)• 52(34h): Font 12x10 (2 lines per displayboard, 11 characters per line)• 53(35h): Font 24x13 (only numbers, 1 line per displayboard, 6 numbers and two punctuation marks per line)

3.1.6 Example

3.1.6.1 Fixed string writing with graphic frame

Data:

- String: MICROGATE
- Displayboard line: 2
- Displayboard column: 1
- Font: MEDIUM

String to be sent:

Field	Byte	Content(hex)	Meaning
Start of Frame	0	0x1B	Start of command
Address	1	0x40	Identifier of Graphic Displayboard
Command	2	0x53	Fixed String Command
Start of Horizontal Coordinate (First byte)	3	0x5A	Column 1 -> 90 pixels -> in hex 0x54
Start of Horizontal Coordinate (Second byte)	4	0x00	
Start of Vertical Coordinate (First byte)	5	0x30	Line 2 -> 48 pixels -> in hex 0x30
Start of Vertical Coordinate (Second byte)	6	0x00	
Binary operation	7	0x00	No operation
Font	8	0x02	Font MEDIUM
Data	9	0x4D	Character M
Data	10	0x49	Carattere I
Data	11	0x43	Character C
Data	12	0x52	Character R
Data	13	0x4F	Character O
Data	14	0x47	Character G
Data	15	0x41	Character A
Data	16	0x54	Character T
Data	17	0x45	Character E
End of Frame	18	0x03	End of Command
Checksum	19	0x58	7-bit checksum made on whole frame: $0x1B+0x40+0x53+0x5A+0x30+0x02+0x4D+0x49+0x43+0x52+0x4F+0x47+0x41+0x54+0x45+0x03 = 0x3D8$ $0x3D8 \text{ AND } 0x7F = \mathbf{0x58}$

3.2 APPENDIX B

3.2.1 Coin Box Connections

1. Line

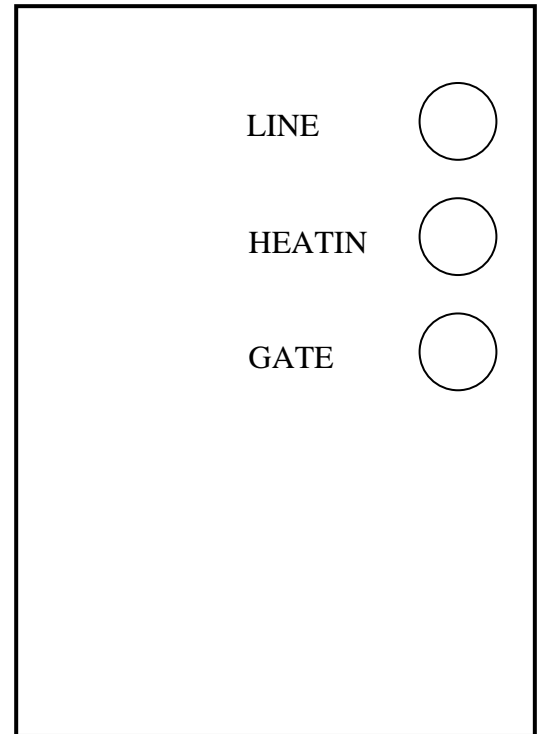
- 1 Start
- 2 Enables
- 3 Parallel enables
- 4 Red line
- 5 Start 2
- 6 Green line

2 Heating

- 1 Pole 1
- 2 Pole 1
- 3 Not used
- 4 Pole 2
- 5 Pole 2
- 6 Not used

3. Gate

- 1 Start (NO - Normally Open)
- 2 Not used
- 3 Ground
- 4 Not used
- 1 Start 2
- 6 Not used



BOTTOM VIEW



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